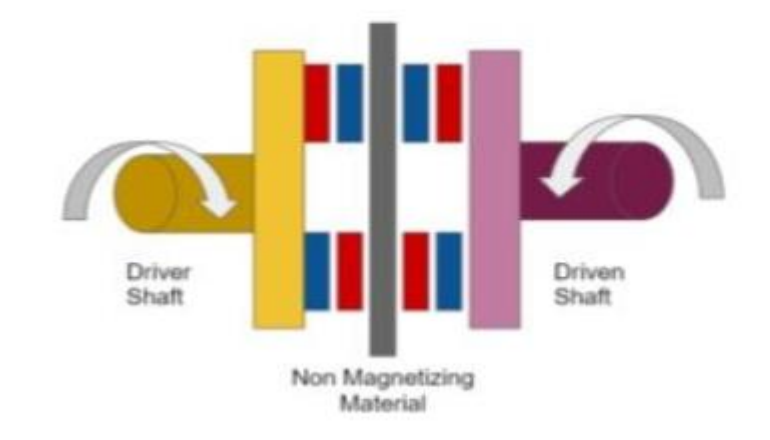

Universal Coupling


Sleeve Coupling


Jaw Coupling



Magnetic Coupling


Gear Coupling

SHAFT COUPLINGS : TYPES, WORKING, DIAGRAM, ADVANTAGES AND APPLICATIONS

CREATED BY – MECHANICAL KNOWLEDGE

WHAT IS SHAFT COUPLING?

- ✓**SHAFT COUPLINGS** are used to join together or **COUPLE** two shafts belonging to two separate machines or components, each shaft having its bearings, and the two shafts being more or less co-axial. Couplings must transmit both angular rotation and torque.
- ✓Shafts are usually available up to 7 meters in length due to inconvenience in transport. To have a greater length, it becomes necessary to join two or more pieces of the shaft utilizing a coupling.

PURPOSES OF SHAFT COUPLING:

- ✓To provide for the connection of shafts of units those are manufactured separately such as a motor and generator and to provide for disconnection for repairs or alternations.
- ✓To provide for misalignment of the shafts or to introduce mechanical flexibility.
- ✓To reduce the transmission of shock loads from one shaft to another.
- ✓To introduce protection against overloads.
- ✓ It should have no projecting parts.

REQUIREMENTS OF GOOD COUPLINGS:

✓A good coupling should have the following requirements:

1. It should be easy to connect and disconnect.
2. It should transmit the full power from one shaft to another shaft without losses.
3. It should hold the shafts in perfect alignment.
4. It should reduce the transmission of shock loads from one shaft to another shaft.
5. It should have no projecting parts.

TYPES OF SHAFT COUPLINGS:

✓ Shaft couplings are divided into two main groups as follows:

1. RIGID COUPLING
2. FLEXIBLE COUPLING

RIGID COUPLING:

✓ It is used to connect two perfectly aligned shafts. Following types of rigid coupling are important from the subject point of view:

1. Sleeve or muff coupling.
2. Clamp or split-muff or compression coupling, and
3. Flange coupling.

SLEEVE OR MUFF COUPLING:

✓ It is the simplest type of rigid coupling, made of cast iron. It consists of a hollow cylinder whose inner diameter is the same as that of the shaft. It is fitted over the ends of the two shafts utilizing a gib head key, as shown in Fig. The power is transmitted from one shaft to the other shaft utilizing a key and a sleeve. It is, therefore, necessary that all the elements must be strong enough to transmit the torque.

SLEEVE COUPLING

Driven shaft

Sleeve

Holes for bolts

Driving shaft

ADVANTAGES OF MUFF COUPLING:

- It is simple, it has only two parts a sleeve and a key
- Since it has no projecting parts hence it is safe to use
- It has compact construction
- It is cheaper compared to other types of couplings

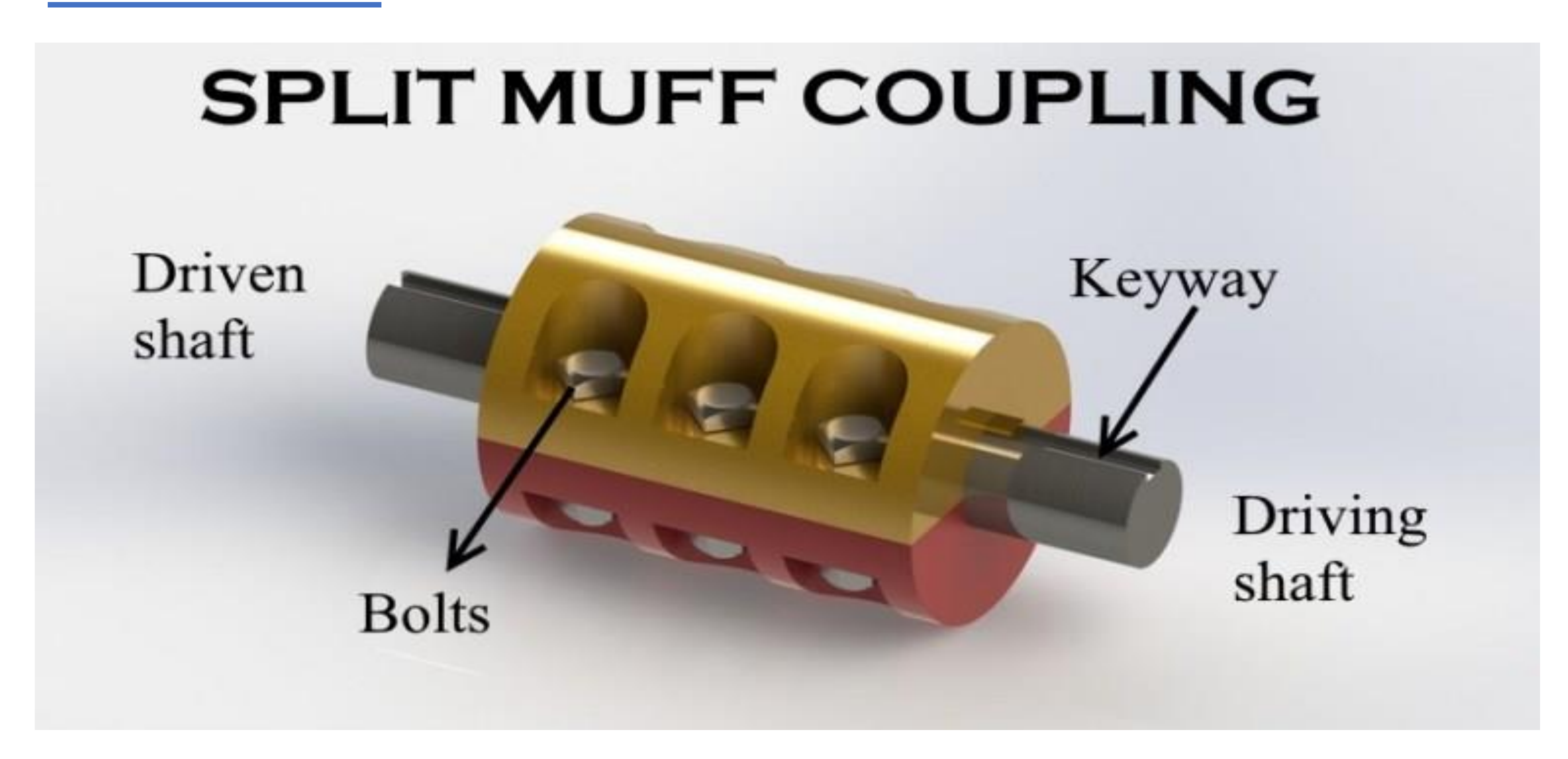
DISADVANTAGES OF MUFF COUPLING:

- It is difficult to assemble or dismantle.
- Since it is a rigid coupling so it cannot accommodate any misalignment.
- Due to the absence of flexible elements it cannot absorbs shocks and vibrations

CLAMP OR SPLIT MUFF OR COMPRESSION COUPLING:

- ✓It is also known as split muff coupling. In this case, the muff or sleeve is made into two halves and is bolted together as shown in Fig. The halves of the muff are made of cast iron. The shaft ends are made to about each other and a single key is fitted directly in the keyways of both the shafts. One-half of the muff is fixed from below and the other half is placed from above. Both the halves are held together utilizing mild steel studs or bolts and nuts. The number of bolts may be two, four, or six. The nuts are recessed into the bodies of the muff castings. This coupling may be used for heavy-duty and moderate speeds. The advantage of this coupling is that the position of the shafts need not be changed for assembling or disassembling of the coupling.

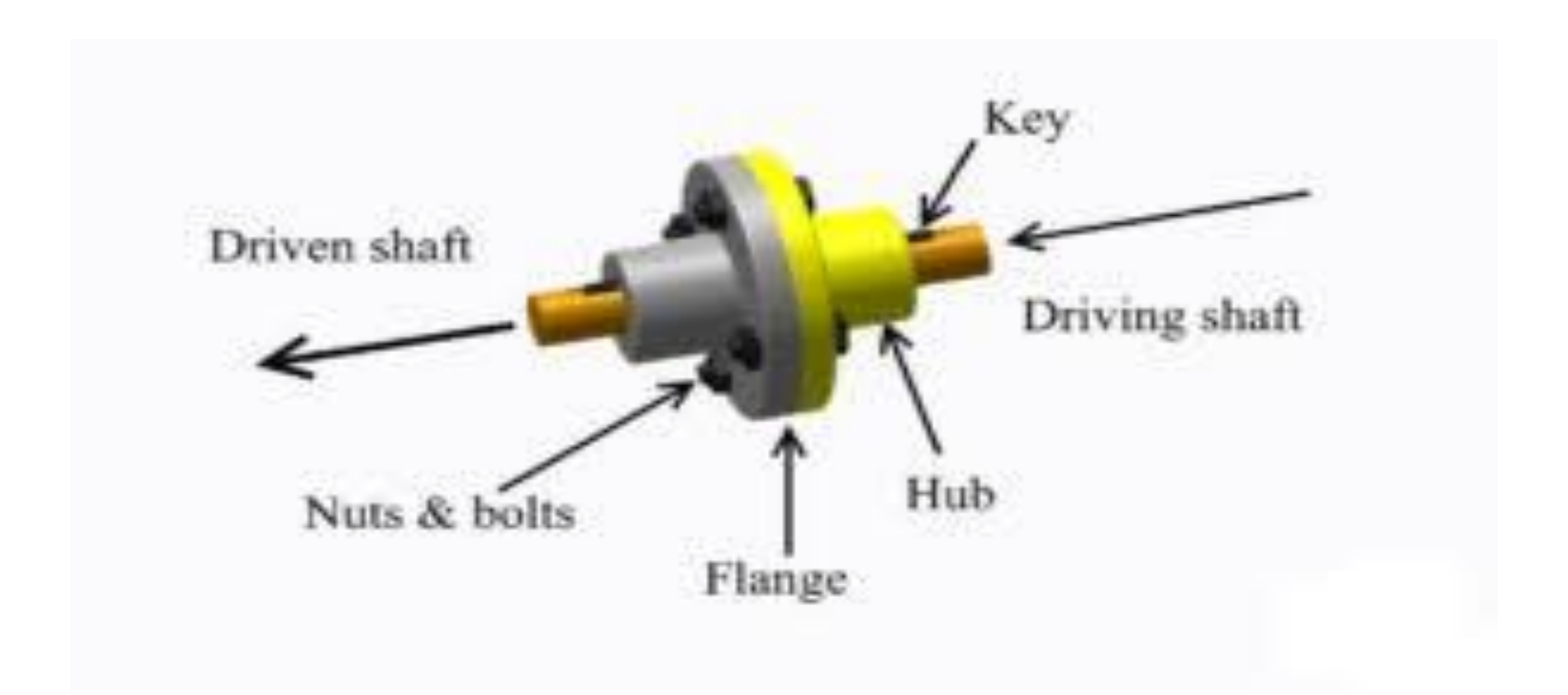
CLAMP OR SPLIT MUFF OR COMPRESSION COUPLING:



FLANGED COUPLING:

- ✓A flange coupling usually applies to a coupling having two separate cast iron flanges. Each flange is mounted on the shaft end and keyed to it. The faces are turned up at the right angle to the axis of the shaft. One of the flange has a projected portion and the other flange has a corresponding recess.
- ✓This helps to bring the shafts into line and to maintain alignment. The two flanges are coupled together utilizing bolts and nuts. The flange coupling is adopted to heavy loads and hence it is used on large shafting.

FLANGED COUPLING:



FLANGED COUPLING:

- ✓ The flange couplings are of the following three types :

1. Unprotected type flange coupling.

- ✓ In an unprotected type flange coupling, as shown in Fig. each shaft is keyed to the boss of a flange with a countersunk key and the flanges are coupled together utilizing bolts. Generally, three, four, or six bolts are used. The keys are staggered at a right angle along the circumference of the shafts to divide the weakening effect caused by keyways.

2. Protected type flange coupling.

- ✓ In a protected type flange coupling, as shown in Fig. , the protruding bolts and nuts are protected by flanges on the two halves of the coupling, to avoid danger to the workman.

3. Marine type flange coupling.

- ✓ In a marine type flange coupling, the flanges are forged integral with the shafts as shown in Fig. The flanges are held together utilizing tapered headless bolts, numbering from four to twelve depending upon the diameter of the shaft.

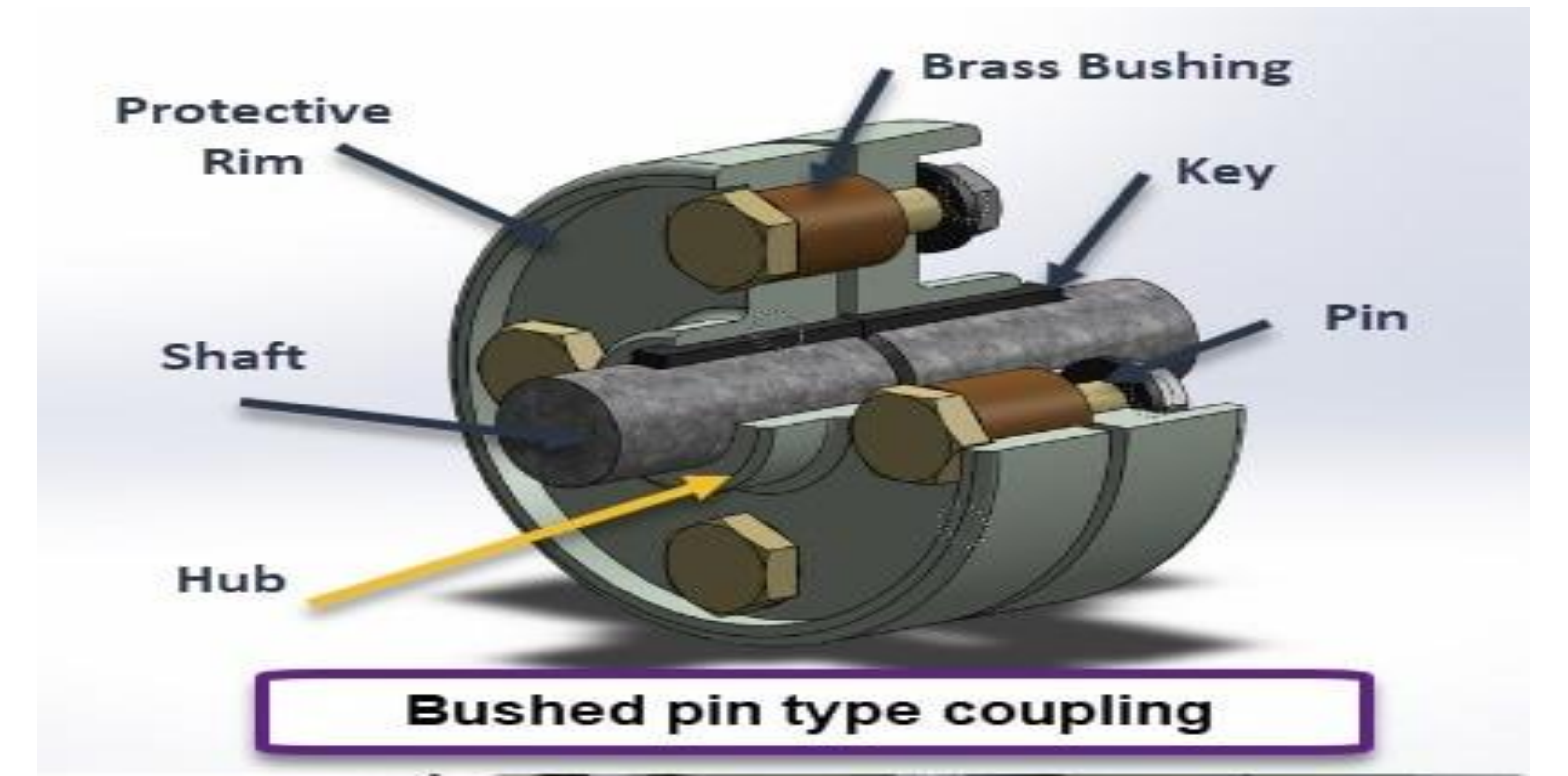
FLEXIBLE COUPLING:

- ✓We have already discussed that a flexible coupling is used to join the abutting ends of shafts when they are not in exact alignment. In the case of a direct-coupled drive from a prime mover to an electric generator, we should have four bearings at a comparatively close distance. In such a case and many others, as in a direct electric drive from an electric motor to a machine tool, a flexible coupling is used to permit an axial misalignment of the shaft without undue absorption of the power which the shaft is transmitting.

TYPES OF FLEXIBLE COUPLING:

✓Following are the different types of flexible couplings :

1. **BUSHED PIN FLEXIBLE COUPLING**
2. **OLDHAMS COUPLINGS**
3. **UNIVERSAL COUPLINGS**



BUSHED PIN FLEXIBLE COUPLING:

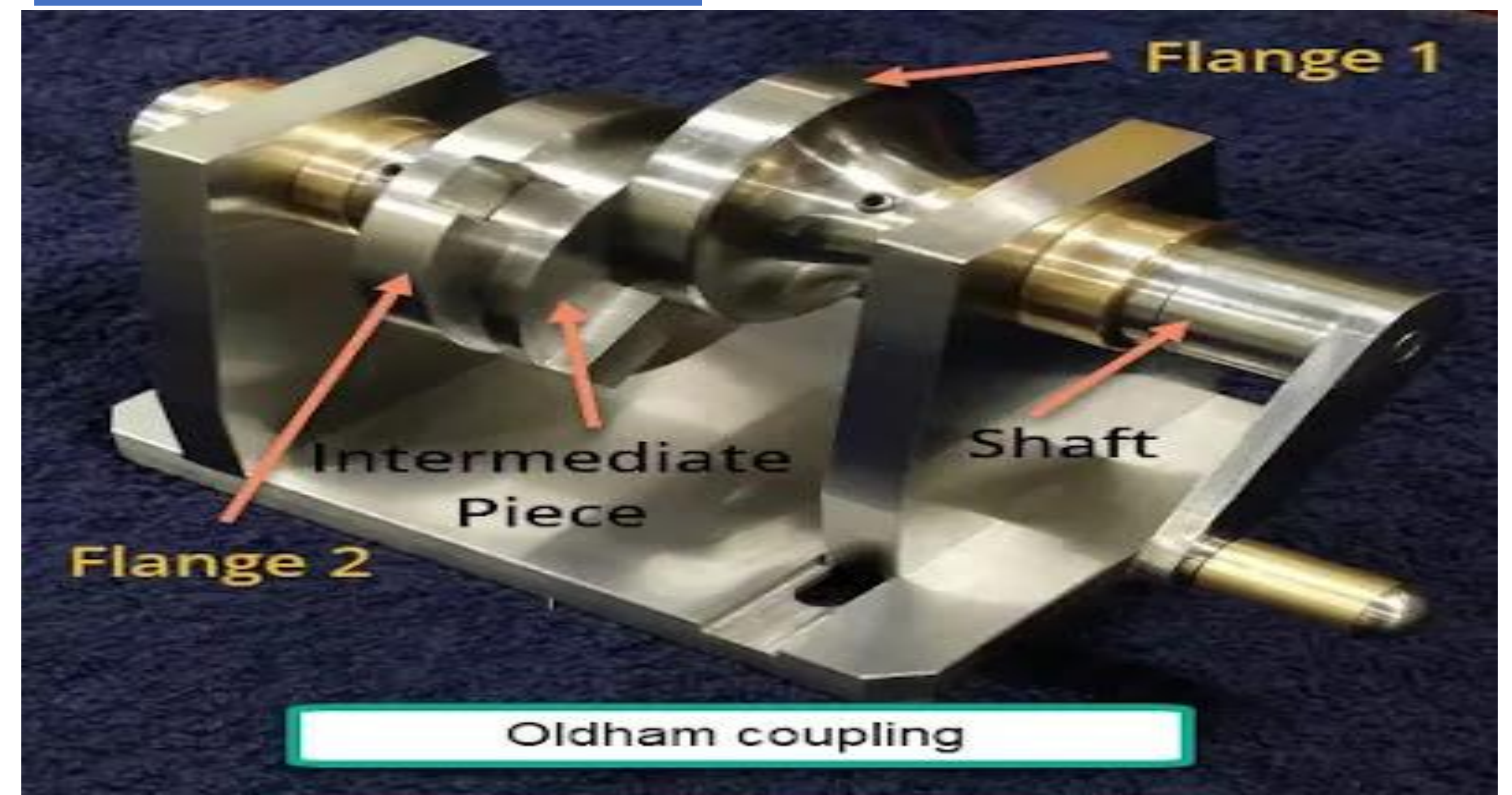
- ✓You could say that this coupling is an upgraded version of flange coupling. The only difference between them is the usage of rubber bushings. Slightly thick rubber bushings are designed so that the studs or bolts perfectly fit inside it and bushing fits perfectly inside the holes provided.

- ✓The major advantage of using this coupling is that it can be used for slightly misaligned shafts. The rubber bushings add a certain amount of flexibility to the coupling which also helps to absorb shocks and vibrations.

OLDHAMS COUPLINGS:

- ✓It is used to connect two parallel shafts whose axes are at a small distance apart. Two flanges, each having a rectangular slot, are keyed, one on each shaft. The two flanges are positioned such that, the slot in one is at the right angle to the slot in the other. To make the coupling, a circular disc with two rectangular projections on either side and at the right angle to each other is placed between the two flanges. During motion, the central disc, while turning, slides in the slots of the flanges. Power transmission takes place between the shafts, because of the positive connection between the flanges and the central disc.

OLDHAMS COUPLINGS:



UNIVERSAL COUPLINGS:

- ✓ A universal or Hooke’s coupling is used to connect two shafts whose axes intersect at a small angle. The inclination of the two shafts may be constant, but in actual practice, it varies when the motion is transmitted from one shaft to another. The main application of the universal or Hooke’s coupling is found in the transmission from the gearbox to the differential or back axle of the automobiles. In such a case, we use two Hooke’s coupling, one at each end of the propeller shaft, connecting the gearbox at one end, and the differential on the other end. A Hooke’s coupling is also used for transmission of power to different spindles of multiple drilling machine. It is used as a knee joint in milling machines.

UNIVERSAL COUPLINGS:



APPLICATIONS OF COUPLINGS:

1). Sleeve muff coupling – Line Shaft in Power Transmission.

2). Clamp or split-muff or compression coupling – Line Shaft in Power Transmission.

3).Flange coupling – For Alignment Accuracy, e.g. Marine.

4). Bushed pin flexible coupling – Used to Connect which have small parallel misalignments, angular misalignment or axial misalignments e.g. Automobiles

5).Universal coupling – Used to transmit rotary motion or power e.g. Aircraft, Driveshafts, etc.

6).Oldham's coupling – Useful in applications where parallel misalignment is present e.g. Printing Applications